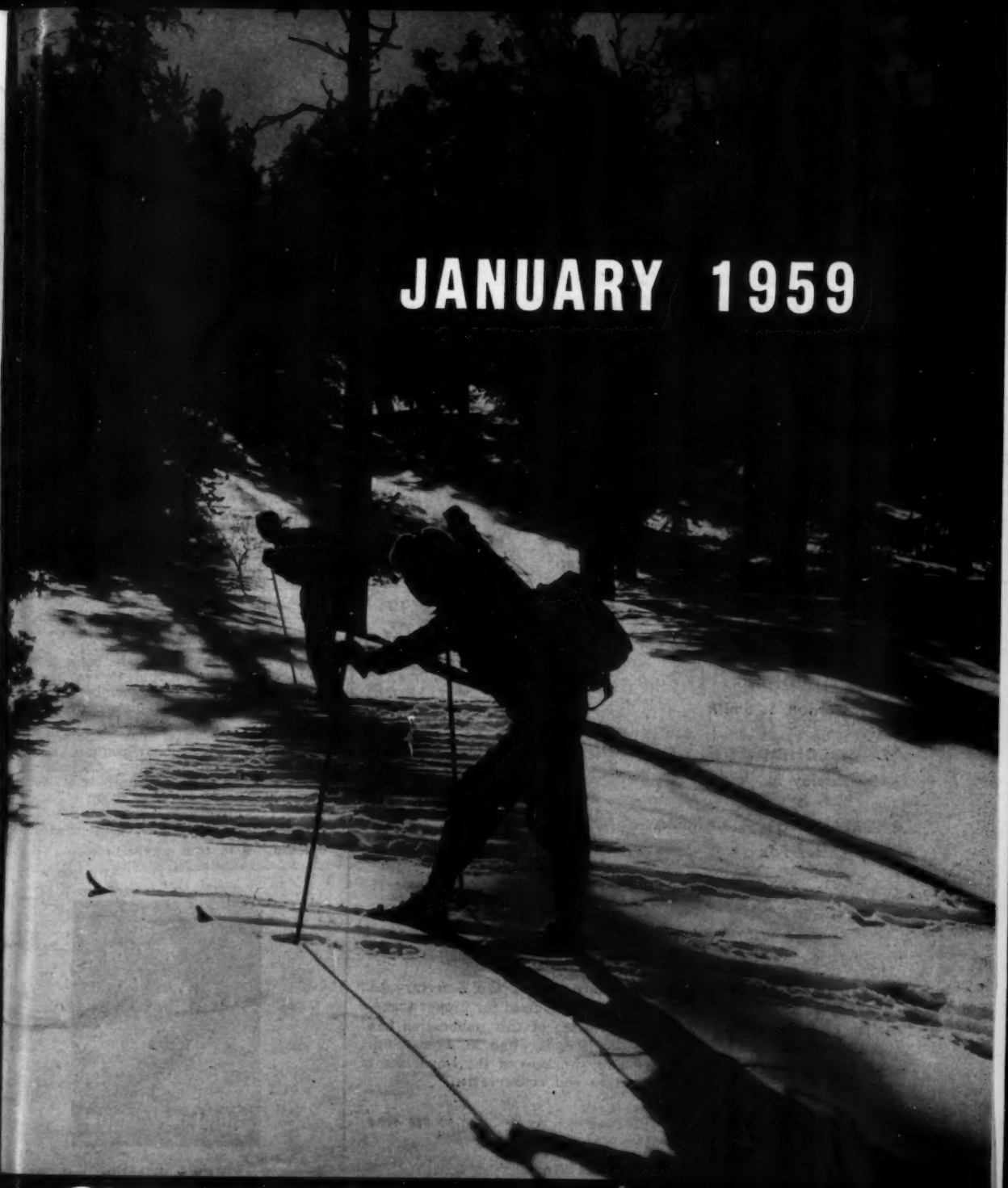

JANUARY 1959

SOIL CONSERVATION

Soil Conservation Service • U. S. Department of Agriculture

SOIL CONSERVATION

JANUARY—1959

VOL. XXIV NO. 6

EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

DONALD A. WILLIAMS
ADMINISTRATOR, SOIL CONSERVATION SERVICE

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE
U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

★ THIS MONTH ★

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TOM DALE, Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, June 26, 1958. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

15 CENTS PER COPY

$1.50 PER YEAR

FOREIGN—$2.25 PER YEAR

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SUPERVISORS' RESPONSIBILITIES.—The supervisors of the Newberry Soil Conservation District, S. C., were hosts to their affiliate members at a supper meeting. Each supervisor discussed a phase of the district's activities. Following the meeting, the editor of the *Newberry Observer* wrote this editorial:

"The average person does not realize the tremendous responsibilities and duties of Newberry County's five Soil Conservation District supervisors.

"They perform valuable service to the communities in which they live—a service which is rendered absolutely free.

"Our attention was directed to these responsibilities during a recent banquet given by the soil conservation district in honor of affiliate memberships.

"It is through these affiliate memberships, local businessmen who themselves are conscious of the growing need for conservation, that the district supervisors are able to carry out their duties. Money collected through these memberships is used to buy various supplies essential to their work.

"The saga of these unsung supervisors began 20 years ago, when the South Carolina general assembly enacted into law the Soil Conservation District Act."

Editors are invited to reprint material originating in this magazine.

FRONT COVER.—Volunteer snow surveyors on their way to measure snow pack on a snow course in Nevada.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

A Visit to the Soviet Union

By CHARLES E. KELLOGG

OUR Mission to study soil and water use in the Soviet Union traveled from the United States to Moscow by air, via London, Brussels, and Copenhagen. We returned from Moscow, via Copenhagen and London. Aside from the travel time to and from Moscow, we spent 33 days in the Soviet Union, from July 18 to August 20, 1958. We traveled several thousand miles over the Soviet Union in Soviet airplanes. Numerous side trips and field trips were made by auto. One member of our party, Mr. Bulik, spoke Russian fluently; in addition, we had reliable Soviet interpreters with us at all times.

Except for visits near Minsk, in White Russia, to see research on drainage and field methods for the reclamation of organic soils, the field studies of the Mission were made in relatively treeless areas: in the Ukraine; in Russia proper, near Stalingrad, Rostov, and Krasnodar; and in the Soviet "Republics" of Uzbek and Kazakh in west-central Asia.

The people seemed very friendly everywhere we went. The farm people were hard working and seemed intelligent. Illiteracy is rare. Attendance in the 7-year schools is everywhere compulsory. But not everywhere do the people necessarily learn Russian. There are 82 languages in the Soviet Union and Russian is not required in all the 7-year schools, though people who expect to get ahead in science, art, or politics learn Russian.

The farms are very large, according to American standards. As a result of recent consolidations of collective farms, there are now fewer than 90,000 state and collective farms in the whole Soviet Union. Except for the small private plots of families on these farms, there are essentially no family operated farms. I was told that there are a few family farms in remote areas surrounded by non-arable land. On a trip in 1945 I visited a family operated farm in eastern Siberia, but we saw none on this trip.

Except for some estates and a few communities, modern farming was not undertaken on a wide scale until after the 1920's. Because of the confusions resulting from World War I and the Revolution it was not until the late twenties and early thirties that modern farming practices were instigated. Then World War II wrought terrible devastation to cities and farms alike in most of the area we visited, which was occupied by the German Army.

In the Soviet Union there are large areas of good soil, including much yet to be developed by ordinary clearing and breaking, by drainage, or by irrigation, drainage, and salinity control. Some development of good soil has been delayed by lack of transportation.

Many of the good soils were developed naturally under grass or a combination of grass and forest, on undulating deposits of loess. Much of the agricultural land has a moderate to high climatic risk. Some years are too cool and wet from an extension of the Baltic climate, and some summers are dry from an extension of the Medi-

Recent agreements between the governments of the United States and the Soviet Union, providing for cultural and scientific exchanges, included a Mission on soil and water use from this country to the Soviet Union last summer. Charles E. Kellogg, assistant administrator for Soil Survey of the Soil Conservation Service, was chairman of the Mission. In addition, the Mission included Marlin G. Cline of Cornell University, D. W. Thorne of Utah State College, Joseph J. Bulik of the Foreign Agricultural Service of the U. S. Department of Agriculture, and Louis B. Nelson, W. H. Allaway, and W. W. Donnan of the Agricultural Research Service of the U. S. Department of Agriculture.

This article is a digest of the summary of impressions of the Mission, prepared by Dr. Kellogg soon after his return to the United States. All photographs were taken by Dr. Kellogg.

The central part of the University of Moscow.

terranean climate from the south or of the dessert climate from Middle Asia.

Most farms have made big strides toward mechanization and electrification, especially very recently with the transfer of much heavy equipment and responsibility from the machine and tractor stations to the farms. Some collectives are poor and are not electrified and are short on machinery. The big machines, especially crawler tractors and heavy combine harvesters, are symbols of modern progress to many Soviets.

We saw some excellent machines, including those required for accurate placement of fertilizers at seeding time for corn and cotton and for applying supplemental fertilizers later. We saw good machines for making ditches and other works of improvement. Part of these, however, were testing models and not widely produced. Many farms have milking machines and carriers on tracks for silage and other carriers to remove the manure from barns.

Yet other aspects of farming operations are far from modern. On most farms, for example, the manure is pitched by hand into small wagons and hauled to the field by horses. Many of the dairy cattle are fed green-cut fodder, and much of this is cut by hand and hauled to the barn in small animal-drawn carts. At the same time, we saw modern silage harvesters that fed into the trucks that hauled the silage to storage. In places, much hand work with

Laying drainage tile in peat soil near Minsk, back of a ditch digger of modified Dutch design.

Demonstration near Minsk of making third-order drainage ditch in peat soil.

short-handled hoes is done to control weeds in vegetables, cotton, and other row crops.

We were impressed by some of the crop-breeding work, especially by efforts to develop early-maturing varieties of cotton and rice to make high production of these crops possible during short warm seasons.

The manufacture and the use of fertilizers are expanding. New plants are under construction and others are in plans. There is emphasis on phosphorus and nitrogen, in many places on potassium, and in some places on certain of the minor nutrients. Deficiency symptoms were noticeable, although not extreme considering that this was a wet summer. Skill in the use and application of fertilizers is increasing but

Large plow used for first tillage of drained peat soils, near Minsk.

Soviet farm managers have a considerable way to go in this skill to equal, let us say, the Dutch, Belgian, British, and American farmers.

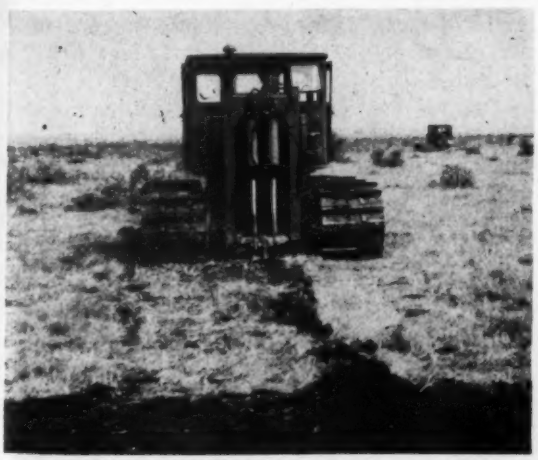
Deficiency of transport is a serious limiting factor to agriculture in the Soviet Union. The country is very large and the rivers are nothing like so helpful as those in western Europe and in central United States. Thus transport is difficult for getting such supplies to the farms as lime, lumber, fertilizers, and machinery. And, of course, it is difficult to transport the farm products promptly to the places where they are required.

For some reason the Soviet Government has not placed a high priority on highway construction. The roads to most farms are ungraded and are either very muddy and rough or very dusty and rough. This means that most trucking is done by relatively small trucks of 2 to 3 tons. Because of these serious limitations of transport, it is difficult to get building materials for houses in many places. It has resulted in the inefficient production of some crops, such as fruits and vegetables, in places not well suited to them.

The amount of labor on many farms seemed excessive to us. Some chairmen of collective farms agreed they could operate with considerably less labor. But of course this situation cannot change until there are more factory jobs and other economic opportunities for people now on collective farms.

The weed problem is generally serious on most farms that we saw. Perhaps this problem became worse during the confusion of World War II. As a result costs are high for extra tillage and hand labor; and the good structure of some soils is injured by this excess tillage. For high efficiency a large increase in chemical herbicides is needed, especially on the grain crops, including rice. Most Soviet agriculturists are aware of this need.

A group of better class homes on a collective farm near Dnepropetrovsk.



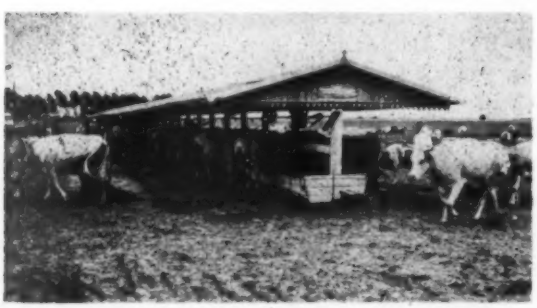
Mole drainage machine operating in peat soil near Minsk. Hydraulic system at rear controls the grade level.

The collective farms vary widely in income. Those that were examined were, of course, somewhat better than average. Including both payments in cash and payments in kind, a standard work-day unit ranges from around 7 or 8 rubles to 25 or 26 rubles. (Ten rubles equal about 1 dollar.) We have no doubht that some are lower. The problem of these low-income collective farms has led to the concentration of

Harvesting silage on a collective farm near Rostov.

management skills by the consolidations of collective farms. The Communist Party watches the farms and arranges that poor farms select competent chairmen in order to improve the farms.

Living standards vary considerably among farms, depending upon their income. Generally they are lower than the living standards on commercial farms in the United States, but they are much better than those common in the villages of southern Asia. Many of these farms had difficulty in building houses for their people immediately after World War II. On the more productive farms the old houses are gradually being replaced with considerably better ones. A typical new one-family house has a living space of about 60 square meters. It has a metal roof, good windows, and warm walls. A few even have small refrigerators and other conveniences.



Typical dairy herd as milking time approaches on a collective farm near Kiev.

Farm planning based on soil maps is generally good. By our standards these maps lack some in both cartographic and classificational detail. It was explained to us in Rostov that following the soil mapping, and any additional soil testing, farm plans were made cooperatively by the experts on the farms and those in the government. Disagreements and difficult situations were said to be ironed out in conference; and when the plans were finally agreed upon the chairmen of collective farms and managers of state farms were expected to adhere to them.

Because of the widespread knowledge of soil classification among the agriculturists, including the agronomists on farms, and because of the controls inherent in the Soviet system, we saw relatively few instances of soils unsuited to agriculture being used for agriculture. We were impressed in the "new land" area, for example, with the care with which soils subject to serious hazards of drought, erosion, or blowing were avoided for field crops and the care with which they were maintained in vegetation. We saw very little overgrazing of grassland subject to erosion or blowing. Some of the other details of farm planning were carried on with less precision and accuracy than in the United States. Then too, we noted some sig-

nificant differences between the plans and the actual cropping patterns on the ground.

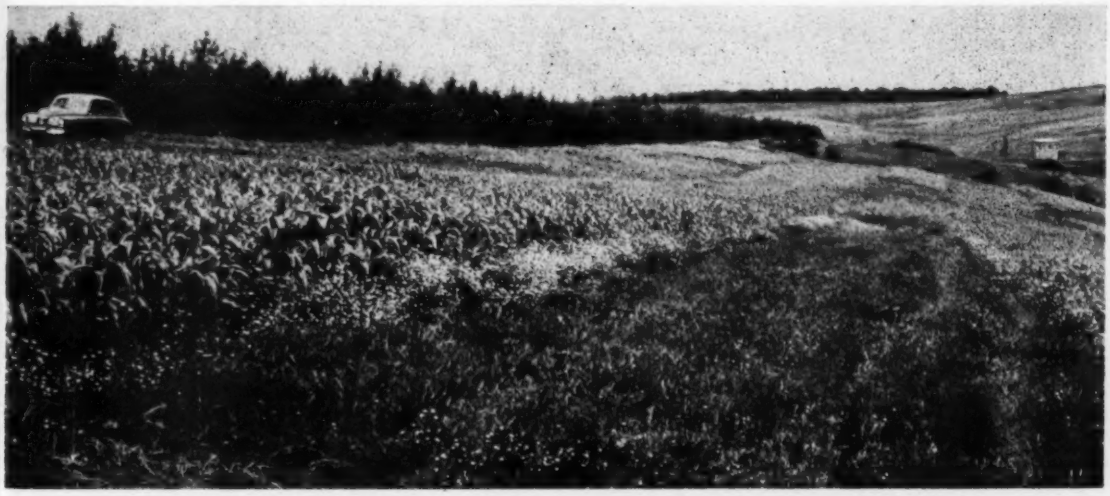
Generally, soil erosion is less serious in the Soviet Union than in the United States, partly because a higher percentage of the land used for crops is level to undulating, partly because of the pervious nature of the majority of soils, and partly because a smaller part of the rain comes in showers of high intensity. In many places, however, the perennial streams have entrenched themselves deeply into the loessial plains. Natural ravines lead back from the rivers into these plains and along their sides one sees considerable gullying. This was especially noticeable along the lower Volga and Don Rivers. Other examples could be seen along streams in the Ural Mountains and elsewhere.

The Soviets do well with vegetative practices for erosion control, such as tree planting and guarded grass, but they make rather poor use of terraces, diversion terraces with chutes, and other farm structures for gully control. They know how to make such kinds of structures; we saw them along railways and near some cities. Except for large dams, canals, and similar works, civil engineering is far less applied on farms than is mechanical engineering.

We saw a good many shelterbelts and windbreaks, partly to protect crops from hot summer winds and partly to guard against soil blowing. Perhaps some serious hazards of soil blowing exist in the Volga region east of Stalingrad and elsewhere that we did not visit. We do not know. But on the whole that problem was not so apparent as we had anticipated from other reports. Of course, this was a wet year, but still the soils did not show much evidence of recent damage from blowing.

Good wheat ready for harvest on a collective farm near Kiev. Farm manager at left; chief agronomist of the farm at right.

The people of the Soviet Union have plenty of room for both vertical expansion on their present farms and for aerial expansion onto good soils. No doubt a great deal more cropland will be made available through drainage and irrigation and a good deal of present cropland will be improved by better practices. Plant-



Stripcropping with protective forest planting on a ravine slope near Poltava in the Ukraine.

Unloading green oats and vetch at dairy barn on collective farm near Minsk.

ing of shelterbelts will help some to protect crops against hot winds. But agricutural planning will need to take account of the climatic risks. Of great general importance will be better and more rapid transport, better storage, and better processing facilities for perishable crops.

Much of their soil and water research is good and interesting. On the whole we did not find it quite so good as we had expected. Currently, as in the United States, many of the most brilliant and promising students are going into physical sciences rather than into the agricultural sciences. We saw many research institutes with good staffs and facilities. The weight of authority and of seniority perhaps holds back some of the new ideas of the younger men and women scientists more than in the United States.

Tractor-mounted fertilizer distributor for side-dressing irrigated cotton on a collective farm near Andizhan, Uzbek.

The soil classification seems a bit out of date to us. It is extremely classifical. From 1870 until World War I the basic aspects of soil classification were more highly developed in the Soviet Union than elsewhere. The system has been accepted in much the same form as it was finally developed by the famous Professor K. D. Glinka in the early 1920's, except for minor changes and qualifications now needed for making detailed maps of farms.

Many of the farms have maps at scales of 1:10,000 to 1:25,000. The plan calls for completion of soil maps on all farms in most "republics" within 3 to 5 years. On the other hand, soil classification is emphasized very strongly in all the teaching of agriculturists in the universities and in the institutes. Thus nearly all of the agronomists, irrigation engineers, and others working on or with farms know the soils well—far better than comparable agricultural specialists in the United States.

The drainage work is proceeding with good machines. The designs are probably based a great deal on examples from Holland and elsewhere. The tile we saw is of rather poor quality, and apparently tile are not yet widely used.

In our view much of the peat land was being somewhat overdrained, as is also true in some parts of the United States. In the irrigated sections we were strongly impressed with the inadequacy of drainage in areas that may become salty. Some of the reclamation projects will certainly require additional drainage for continued success.

We were impressed with the heavy work for irrigation, including the main canals and the canals leading to the farms. But the handling of the water on the farms was not so good as on most commercial farms in the western part of the United States. Our irrigators on farms in the United States waste water; but, it seemed to us that Soviet irrigators were wasting more.

Although we saw many useful field experiments, we failed to see a first-class set of experimental plots laid out in the modern design. The experiments on rice fertilization were conducted on fields of about 15 acres. Experiments with grain crops were often carried out by comparing fields of 100 to 500 acres. Of course

such experiments have high errors. As a result, the Soviet experts themselves have uncertainties about many practices that we believe could be clarified with systematic replicated and randomized field experiments.

We were impressed by the increasing emphasis on education and scholarship. Generally, students are chosen for the universities and teaching institutes on the basis of competitive examinations. After admittance, students receive stipends so long as their grades are satisfactory. Those getting the highest grades get additional stipends.

Farm people appear to study available pamphlets and books about agriculture. A great many take correspondence courses with the agricultural institutes in order to receive their diplomas as agronomists, animal husbandry experts, and the like. Certainly, the people on the farms want to improve their standard of living and want more rewards for their hard work and enterprise. Also, they seemed to think that these hopes depend on peace.

We were impressed by the great agricultural exhibits in Moscow and the one in Kiev. At Moscow there is a large area with many permanent buildings to exhibit all phases of Soviet agriculture throughout the country. Movies and other exhibits set forth explanations of the best practices. Workers on farms who have done well get an opportunity to go with their families to this great exhibit. Certainly, it has great educational value, especially for rural youth.

Freshly plowed virgin dark Chestnut soil to be planted to wheat, on a state farm in "New Lands" area in northern Kazakh.

Generally, the Soviets have excellent services for abstracting and translating foreign literature. A high percentage of the agricultural scientists who became members of the Academy of the Sciences of the USSR read English and many of them speak it. Without doubt they are considerably more familiar with our scientific literature than we are with theirs.

Red Steppe cattle on virgin range in "New Lands" area near Akmolinsk, Kazakh.

Local soil scientist, G. I. Gruzdev, stands in front of a 4-year old shelterbelt of Acacia, black poplar, ash, and elm on a state farm near Rostov.

At the present time about as many women as men are trained at the institutes in agronomy and animal husbandry. Some of these women do very well as farm agronomists and are promoted to higher positions in the government. Also many women are being trained at the universities in the sciences basic to agriculture. In fact, the soil scientist now in charge of the most important section of the Dokuchaiev Institute—the section on Soil Classification and Mapping—is a highly accomplished woman who speaks excellent English. (This Institute is a constituent part of the Academy of Sciences of the USSR and is the highest authority on soil science in the country.) Should the Soviet Union become involved in a serious war they will have many well-trained women agriculturists.

We were impressed with the obvious advantage of widespread training in soil classification for all agriculturists who are involved significantly in helping farmers plan the most efficient use of their soils on a sustained yield basis.

In some ways recent experience with shelterbelts in the Soviet Union is similar to ours. Originally the idea in both countries was to have wide plantings in which natural regeneration could be expected. In both countries the tendency is now toward much narrower belts or windbreaks. In the United States we are concerned with both summer and winter winds, whereas the Soviets are primarily concerned with hot summer winds. Their recent experience indicates that shrub rows should be eliminated in field windbreaks and the lowest limbs of trees pruned so that there is about 24 inches of space for the passage of air at ground level.

In large parts of the Soviet Union where rainfall is relatively low and snowfall abundant, special tractor-drawn machines windrow and pack the snow in fields. On many farms this is done 2 or 3 times each winter. On some farms the third operation is done crosswise to the first windrows.

Barring some catastrophe, Soviet farms should increase production substantially, especially in animal products, vegetables, fruits, sugar beets, and other industrial crops. No doubt they could produce considerable grain for export. These increases will depend, however, on increased fertilizer supplies, continued improvement in farm machinery, better and more rapid transport, and more adequate processing of agricultural products, including refrigeration.

I find it impossible to make general comparisons between the agriculture of the Soviet Union and that of the United States or any other country with which I am familiar. The systems are basically different. Some of the agricultural practices seem advanced to an American, some seem inefficient, and some appear doubtful. To the Soviets themselves the most meaningful comparison is between what they had 30 or 40 years ago and what they have now. The improvements are indeed impressive.

STEWARDSHIP OF RESOURCES.—We believe in stewardship of our God-given resources—our soil, water, range, timber, wildlife. Stewardship is vested in both individuals and in groups. Each owner or operator of a farm or ranch has as an obligation to his Creator to use wisely and to protect and improve the land resources that are in his care. Governmental groups have the same stewardship obligations on the public lands they administer for all the people and for generations unborn. We can improve our basic resources. We can rearrange them—can even restore wasted strength and productivity; but we can not create them.

EZRA TAFT BENSON
Secretary of Agriculture

MODERNIZING DRAINAGE METHODS

PLASTIC UNDERDRAINS INSTALLED IN ONE PASS ACROSS THE FIELD MAY SOMEDAY SUPPLEMENT OR REPLACE TILE INSTALLATIONS.

By C. D. BUSCH and T. W. EDMINSTER

WET muddy fields, drowned crops, delays in land fitting, shortened growing seasons, and wet soils are some of the ill effects of poor drainage. Many of these result in losses that can be calculated on a dollar and cents basis. Others such as the time lost with mired equipment and the exasperation at digging it out, can only be estimated.

Farmers with the aid of the Soil Conservation Service and similar organizations, have been meeting the drainage problem as effectively as available methods and finances will allow. Surface ditches, where applicable, provide low initial cost drainage. However, the high maintenance cost and the productive land that is lost to the ditch and its spoil banks make them impractical for many farm fields.

On many soils an alternative is subsurface drainage, of which an estimated 19,000 miles are installed annually in the United States. The total cost of these operations amounts to nearly 15 million dollars. The cost per foot varies with soil conditions, stoniness, labor, etc., from a minimum of around 25 cents to more than $2. Unfortunately, subsurface drainage has not been modernized, either as to materials used or construction methods. Since the first agricultural drain tile was laid in this country near Geneva, N. Y., in 1835, there has been little change in the materials used. Methods have been improved by mechanical diggers and haulers, but much of the job is still not mechanized.

Let us look at the conventional drainage installation to discover where improvement might be possible. First, the trencher removes about 4½ cubic feet, or about 400 pounds, of earth for each linear foot of drain, to create a ditch 3 feet deep and wide enough for a man to work in. The conduit may be clay tile, concrete tile, or bituminous fibre pipe—for simplicity it will be referred to as tile. The tile, weighing 6 to 10 pounds, must be lifted into the trench, alined, and partially backfilled by hand to insure a satisfactory installation. Finally, the ditch must be refilled and the soil allowed to settle.

Throughout the installation process, and sometimes even after its completion, normal farming operations in the vicinity of the drain are impossible. When one considers the total

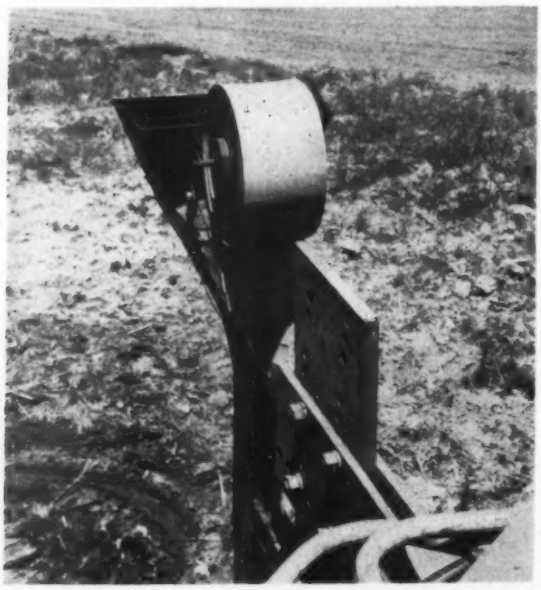
Machine that installs plastic drains at a speed of 1 to 1¼ miles per hour.

Note:—The authors are agricultural engineers, soil and water conservation research division, Agricultural Research Service, Ithaca, N. Y. and Beltsville, Md., respectively.

annual national drainage bill, it is obvious that lower labor or materials costs could result in substantial savings. The Agricultural Research Service and Cornell University cooperatively with the Caterpillar Tractor Company and the Bakelite Company started looking into alternatives.

Early attempts to get around high installation costs had developed the mole drain. In mole drainage a channel is forced through the soil by the "torpedo" of the mole plow at a depth of 2 to 3 feet. In some of the heavier soils under the right moisture conditions the resulting drain, costing 2 to 4 cents a foot, has a long enough life to make its use practical. However, in most cases not only the stability but also the depth and grade of such an installation leave much to be desired.

The ARS-Cornell project has developed the principle of stabilizing the mole drain by incorporating a plastic liner. Precut vinyl plastic sheeting fifteen one-thousandths of an inch thick is shaped into a "U" and fed down into a mole channel to form an arched plastic roof. A conventional mole plow opens the channel; the plastic keeps it open. The plastic is expected to add 4½ cents per foot to the cost of mole drains, bringing the total to around 8 cents per foot. Such plastic drains have been installed at speeds of 1 to 1½ miles per hour. There is no need for backfilling since only a 3-inch channel and a 1-inch slit to the surface have been opened.



Plastic strip is carried on a spool at the rear of the machine. It leaves the spool flat but is formed into an arch as it travels down the chute.

Plastic arch as it appears in the ground after leaving the machine.

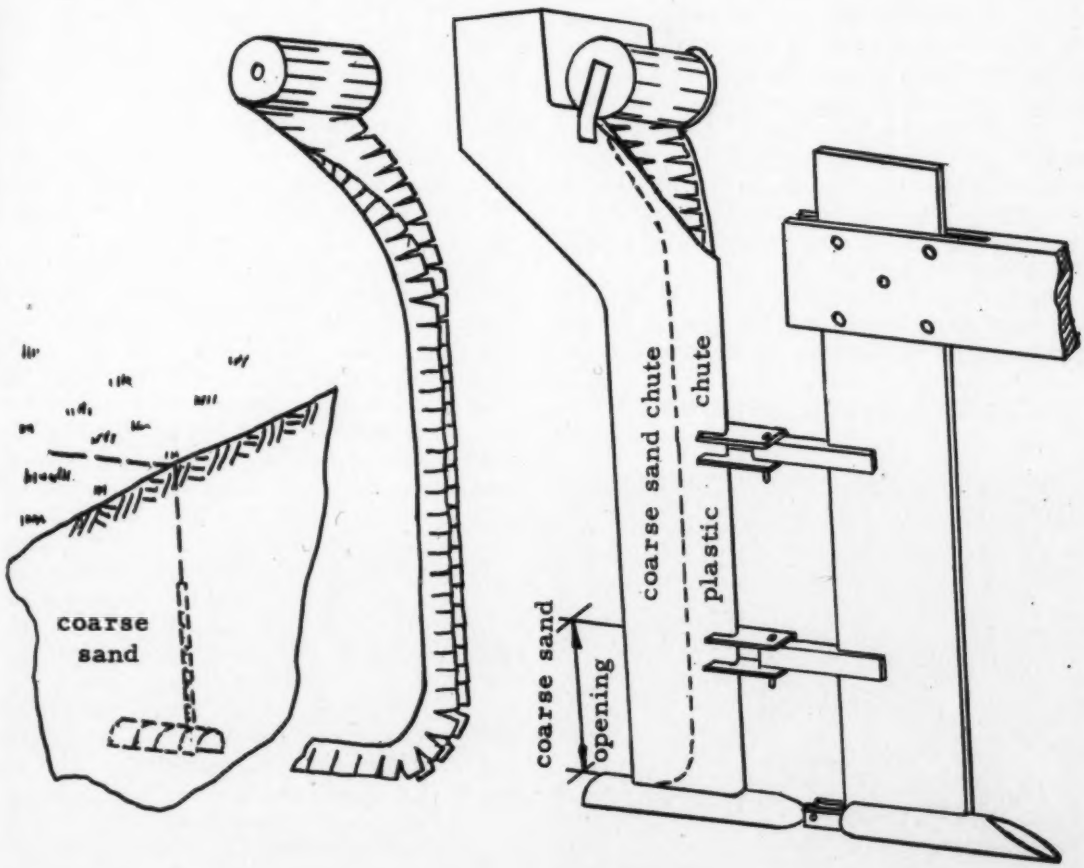
The testing of this new drain is still in its early stages. However, after almost 2 years of accelerated abuse by over-irrigating, 270 feet of plastic-lined experimental drains are still open, while unlined drains in the same field are already plugged. In addition to the question of their water-carrying life, another concern is the effect of surface loads on this type of drain. Preliminary laboratory studies indicate that the lined drains will hold up under normal equipment loads used on the farm. Unlined mole drains also fail when roots plug the channel and when siltation occurs and erosion causes roof cave-ins. The lining is believed to retard all of these.

As testing on the durability of the U-shaped plastic roof continues, development work is underway on a machine, which will simultaneously install a drain floor. The floor can be thinner, cheaper plastic since it will have no structural job to do. It would serve to retard erosion and sedimentation, and increase channel capacity. The additional cost of installing a floor is expected to be no more than one-half cent per foot.

There may be some bugs—or more literally, rodents—in the technique yet. "Mole" drains might become channels for mice or moles. The drier land over a functioning drain, especially under damp mid-winter conditions, affords the most comfortable location for rodents. To date, however, no rodent damage has been observed on the 6,000 feet of plastic drains undergoing field tests. These drains, installed in varying lengths on three different soil types, have functioned adequately through their first year.

The problem of depth control was mentioned earlier in connection with the unlined mole drains. In the plastic-lined installations the necessary grade has been given the drain by a grade line, and surveyed and staked so that the machine may operate at a constant depth. The problem of grade control is greatest where it is desirable to maintain the grade by varying the depth at which the drain is installed below ground level. Several systems of automatic depth control are being studied with an eye to such installation methods.

As development progresses, it seems that research may give a drainage technique that will reduce the initial cost of underdrainage by as much as 50 to 75 percent. Perfection of such a drainage technique will permit fast efficient installation of additional laterals to existing tile lines and should aid in the reclamation of some lands where drainage is not now economical.



INSTALLED DRAIN | PLASTIC TRAVEL | MOLE LINER | MOLE PLOW

A Second Look At Flat Top Water

A Co-Author of the Book on Flat Top Ranch Reappraises the Water System of the Ranch After the Long Drought Ended and Heavy Rains Came.

By J. C. DYKES

"THE time to appraise the efficiency of a ranch water system is during the dry years." These words are from the book *Flat Top Ranch* and were written in July 1956, after 5½ years of drought. The 17,000 acre ranch, owned by Charles Pettit, is in the Lampasas Cut Plain, a subdivision of the Grand Prairie, in Bosque County, near Walnut Spring, Tex.

Since the quoted words are mine there will be no quarrel with them here. However, when a ranch water system is subjected to considerably above normal rainfall, it is also wise to take stock. The Flat Top Ranch system got a severe test in 1957, and the rainfall in 1958 was also above average.

Based on an average annual rainfall of 33.69 inches at Fort Worth and the records of the 6 rain gauges on the ranch, which confirm the usual rainfall pattern in Texas—progressively heavier from west to east—an arbitrary average of 32 inches for Flat Top seems reasonable. During the 5½ years of drouth (1951–56) the rainfall on the ranch was short by an estimated 70 to 80 inches—more than the total expected in 2 years. In only 1 year (1955) did the rainfall exceed 20 inches, and in each of 2 years the total was less than 15 inches. In 1957, total precipitation was 47.5 inches—about 50 percent above average. In 1958, above average rainfall continued until the middle of May, and through September 26 the various gauges showed totals of 24 to 27 inches.

In the 26 months between the 2 visits (July 1956 and September 1958) numerous improvements were made in the ranch water system. The dam which created Big Lake was being constructed at the time of the first visit. Big Lake is the upper impoundment of a series of 5 on the East Bosque, the largest stream in the ranch's natural drainage system. The drainage area above the dam is about 12,000 acres, very little of which is Flat Top land. Big Lake has a surface area of about 100 acres. Ranch Manager W. B. (Bill) Roberts says he was particularly interested in how Big Lake would perform when the heavy rains started in 1957. The lake filled slowly and it was not until April 29, when the rainfall totaled 20.5 inches, that the water reached the spillway. According to Roberts the flow continued through the spillway for about 60 days. The rainfall for May was heavy (8.8 inches) but in June there were only 5 small showers totaling about 1 inch. Seeps and springs in the drainage area about the dam continued to release clear water into the lake long after the major rains were over and were, without much question, partially responsible

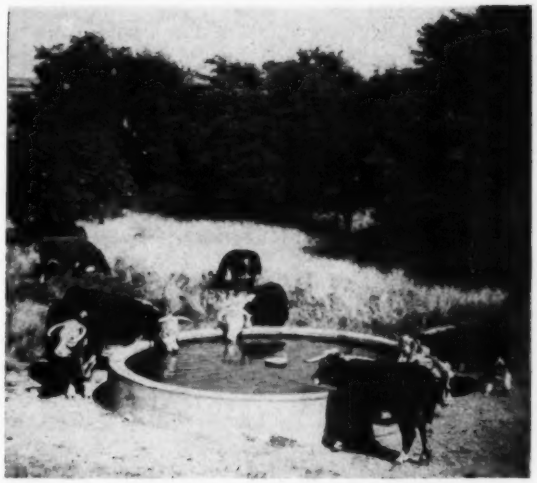
Note:—The author is assistant administrator for field services, Soil Conservation Service, Washington, D. C.

The lower end of a draw-down tube through one of the Flat Top ranch water-control dams.

for maintaining the lake at above spillway level for so long.

In addition to the 5 dams on the East Bosque, there are 6 on Rough Creek and 6 on Flag Branch; both streams are tributaries of the East Bosque. These 17 dams perform a unique function on the ranch. They are so located and built that water backs up in the channels along the gentle valleys from one dam to the downstream toe of the dam above it in the series. There is a drawdown tube through each dam and water is released, as needed, to maintain the level of the water in the streams. The water table in the valleys has been restored and over 200 acres of fertile bottom land is now being subirrigated. This is double the 100 acres subirrigated in July 1956.

In July 1956, there were 43 dams of various sizes on the ranch; now the total is over 60. Mr. Pettit refuses to predict the eventual total. There is a new one under construction and, at least, one more in the planning stage, so the end is not in sight. Mr. Pettit is firmly convinced that subirrigation of the native bluestem grasses pays and says he will continue to construct dams at all suitable sites where he believes the impounded water will improve grass yields. Even the grasses growing along the steep, and oftentime rocky, slopes bordering the subirrigated valleys are benefitting—they were green and growing in late September 1958.



A Flat Top ranch stock water trough.

The heavy rains in the spring of 1957 caused minor to moderate damage to the spillways of a good many water retarding structures in Texas, but the structures did their job well in preventing or reducing flood damage below them. So it was at Flat Top. The spillway on the lowest dam on the East Bosque was partially destroyed, but so well were the 16 dams above it functioning that there was no flooding along the East Bosque after it left the ranch. Bill Roberts stated that while other tributaries of

One of the smaller stock water ponds on Flat Top Ranch.

the Bosque River were out of banks one to several times in 1957, the East Bosque below the ranch never did get over half-bank full before joining the main Bosque.

In the chapter "Flat Top Water at Work," in the book *Flat Top Ranch*, this writer predicted that the neighbors below the ranch would have almost complete flood protection to the point where side tributaries entering the East Bosque below the ranch might cause some flooding in the lower reaches before it joined the main Bosque. But the side tributaries below the ranch drain only small areas, and the control system on the big drainage area above and on the ranch (over 25,000 acres) was so effective that flood damage was completely eliminated along the lower East Bosque in both 1957 and 1958.

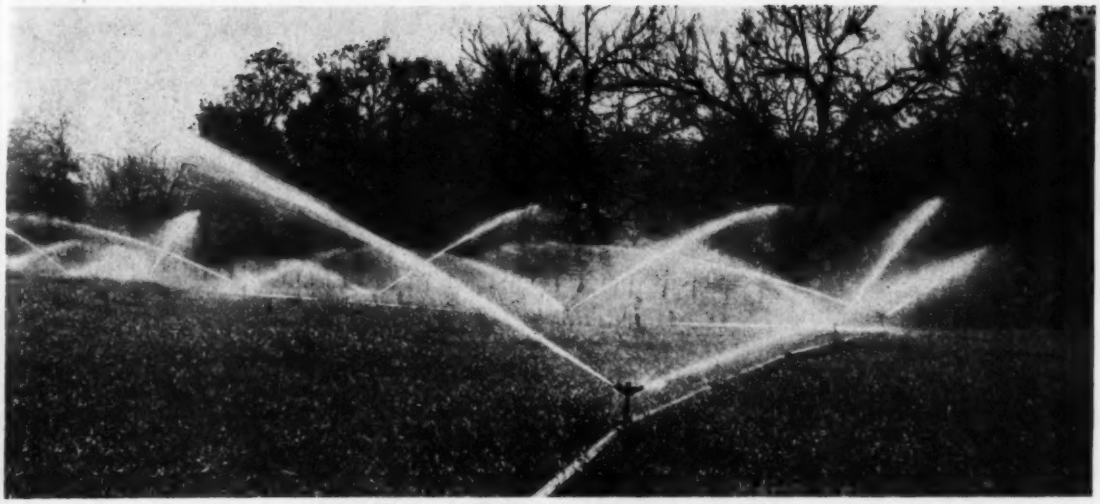
One ramp where Rough Creek water was released into the East Bosque was also damaged during the heavy spring rains in 1957. This ramp and the damaged spillway on the lowest dam on the East Bosque have been replaced with rock and concrete structures in line with general ranch policy of making permanent improvements, as needed.

The 1958 visit was made about 60 days later in the growing season than the 1956 visit. In contrast to the brown curing grass observed on the first visit (July), the ranges and fields were still green and growing in September 1958. There was an abundance of water available for irrigation, and the subirrigated lands were producing as well or better than the irrigated lands.

The increased production of grass resulting from the additional rainfall has led to an increase of about 300 animal units on the ranch. At the low point in stocking in 1956 the ranch was carrying about 1,000 animal units year long. This was a reduction of 60 percent from the high point in 1950 when there were 2,500 animal units on the ranch. Mr. Pettit feels that reductions in the cow-calf operations, such as he made between 1950 and 1956 because of the drouth, are too severe. He plans to solve the problem quite simply—he will never again stock his range as heavily with a breeding herd as he did in 1950.

It was a real pleasure to see the ranch so green so late in the growing season (September). A drive over the ranch flushed numerous coveys of quail, and Mr. Pettit believes the quail population is up sharply. The first ducks

Subirrigated grass for seed, hay, and late season grazing on Flat Top Ranch.



The Flat Top sprinkler irrigation system at work.

of the season were using Flat Top water. The deer and antelope were fat and the wild turkeys numerous. The heavy rainfall had not hurt, and may have improved, the fishing. Perch Lake had water in it for the first time in years. The grass seed harvest was partially over but there was much indiangrass, big bluestem and little bluestem still to be harvested, and what a sight it makes as it ripples in the fall breezes!

Yes, after 21 months of above average rainfall, it is a pretty good idea to reappraise the efficiency of a ranch water system, particularly when it is the system on Charlie Pettit's Flat Top Ranch.

Modern Hunting—

—Old Dominion Style

By GORDON S. SMITH

NO doubt it's happened to you—take off for the annual hunting trip—spend $50 to $100 for licenses and expenses—walk the woods and fields for miles—and come home with nothing but excuses.

Most of us have done it—liked it—and will do it again soon as we get a chance. But let's face it. This double time living pace we're doing these days doesn't leave us time to hit the open trails as much as we'd like to, or should.

Note:—The author is information specialist, Soil Conservation Service, Upper Darby, Pa.

Time is only part of the problem. Recent figures show that a million more sportsmen took to the fields and streams in 1957 than did in 1956. Over 34 million, all told, applied for licenses. Our exploding population is making good hunting and fishing sites harder and harder to come by. When you find a good place to hunt you often take your life in your hands when you wander into the area. Our super-housing projects, superhighways, and super-shopping centers push the wildlife farther away from us each season.

This is part of our modern living. What can

Colbert inspects quail breeding boxes.

we do about it? Jim Colbert, in Rustburg, Va., is working on a good answer to the question. With the help of Dr. Frank Maxey, owner of what was a 375-acre abandoned farm, Colbert has started a regulated hunting farm. Colbert and his wife, Elise, opened up for business during the Christmas Holidays of 1957. It took a bit of doing to get going by then. They had launched the project on some raw, eroded fields only 6 months before.

After Colbert had sold Dr. Maxey on the idea, he checked in with the Robert E. Lee Soil Conservation District. Colbert, an expert hunter, also knew enough about farming to know that he needed some expert advice on healing up gullies and tying down the raw land. He needed to know what shrubs, grasses, and crops to plant to give all kinds of wildlife the best possible cover and food.

The soil conservation district supervisors reasoned that this would be good land use. The land would be protected and become more productive as time went by. They approved the farm for technical help.

John Harrison, the local Soil Conservation Service technician, went to work on a conservation farm plan with Colbert. The plan had a reverse pitch from the usual plans that Harrison had worked on. Wildlife is considered a secondary crop on most farms. Here it was to be the main crop. After checking soils and slopes, Colbert and Harrison started figuring what to plant and where; what water-runoff control would be needed in the fields; and, what kinds of food and cover would best suit the native wildlife. "I want some corn fields, because corn will attract dove. Some good shrub and grass will bring the deer in during the fall hunting season. I want people who hunt here to be able to get almost anything they're after," Colbert told Harrison.

Hunting license regulations differ between States. In Virginia a hunter from out of state needs a $3 license to hunt on a game farm. In open country he would need a $17.50 license. However, if he hunts native game that comes onto the game farm he must have the full license. He must also observe the State game seasons for hunting native game. The pen-raised game season on a game farm is 6 months long—a big advantage to time-pushed sportsmen. It starts on October 1st and extends through March. Colbert has a game farm license to raise wildlife.

The finished farm plan, Colbert's guide for setting up the game farm, included diversion terraces, two farm ponds, stripcropped fields, trees, and enough wildlife food and cover to attract most game birds and animals. Korean lespedeza planted on the contour would make excellent food for bobwhite quail. Shrub lespedezas planted in the guillies would tie down the soil and make good cover for birds. Autumn olive, coralberry, and thornapple shrubs planted

Ringneck pheasants in a pen on the Colbert game farm.

along the wood-edge would provide food and cover for pheasants—especially in the winter snows. Milo, millet, soybeans, cowpeas, and corn planted in contour strips would make good feed for almost any species. Loblolly pine would stop erosion on steep slopes before it could damage the fields below.

The plan looked good to Colbert. Anxious to get the show going, he planted annual Korean lespedeza in several fields. By fall, this made plenty of good food and cover for the quail and pheasant being raised on the farm. Five-hundred loblolly pines planted along a new entrance roadway made a field border and windbreak.

Dog kennels, bird pens, breeding boxes, and, best of all, a handsome rustic hunting lodge took shape. Meanwhile, Colbert concentrated on the first crop of quail, pheasant, and wild turkey. Breeding, feeding, and housing 1,300 quail, a couple hundred pheasants, and a few dozen turkeys was a full time task by itself. This was all new to Colbert. "I got all my advice from the State Game Commission," says Colbert. "Those 72 quail breeding boxes were made according to their design. The pens are built to their specifications, too," he noted.

The healthier quail are paired off in the breeding boxes from April to October. Colbert can get up to 1,600 eggs a month from this production line. He figures it costs him $1.50 to raise each quail.

Colbert's hunter-customers immediately noticed advantages. For once they *knew* the birds were there. They also found them healthier—with more get up and go. The two factors spelled guaranteed action. For many tyros, it was their first chance to shoot over a dog.

Another thing missed but not mourned was that anticipation of some trigger-happy joker sending a blast of birdshot into one's hide. While there's no limit on birds at this game farm, there is on hunters. If they're experienced they can go in groups of three. If not, only one or two may hunt—with a guide. Only 18 hunters are allowed to range at any given time.

The farm plus almost 400 adjoining acres that Colbert has hunting rights for make up four "hunts." A "hunt" is a trail set up so that it will not interfere with any of the other

Jim Colbert accepts a quail from one of the Lodge's bird dogs in a field of annual Korean lespedeza.

hunt trails on the farm. At the beginning of the day Colbert takes a jeep load of birds to the fields. They are dropped off in pairs along the hunts to be used that day. Few of the birds leave the area. They know the food and cover are good there. If 2 hunters are going on a quail hunt, Colbert will release 25 birds along the hunt. If 3 are going out he'll release 35 birds.

When a party takes off from the lodge a guide goes along to show the way. A good dog is a must, too. You can use your own or one of Colbert's. If you're a regular hunter and own a dog, Colbert will board it there in one of the new deluxe kennels for $10 a month.

As the party heads across the fields things start to happen. A good shot can bag almost any number of quail. The base price of $35 per day includes 8 birds. Everything over that costs you $3.50 each. Pheasant and turkey are slightly higher. If you are a real duffer you still get your quail. Eight cleaned and frozen birds are yours to take home even if you don't shoot them.

At the end of the day funnel-like traps are set out in the fields with feed inside. Most of the birds still at large will end up in the traps and return to the pens for another day.

The abundance of wildlife food attracts an unusual number of song birds to the area. Add

that to the mountain scenery and the surroundings are very pleasant.

Proof of the success of this streamlined hunting is the fact that Colbert is already drawing hunters from the Richmond, Washington, and Philadelphia areas. Also, similar hunting farms are springing up all over the country.

Pointing to the low, flat land below the lodge, Colbert remarked, "Next season I hope to have a pond there. We'll have some good duck hunting then. I'll get John Harrison to design a larger pond on down there, and it will make a good bass fishing lake."

Colbert figures it will take about 3 years to get the place in full swing. "With the technical help the Soil Conservation Service is giving me I'll be able to have all the wildlife we could ever use here. When a hunter comes here he'll be sure to go home with a lot more than excuses."

WATER CONTROL FOR WOODLAND IMPROVEMENT

By ROBLEY N. JOBE

THERE are approximately 4.5 million acres of land in the Coastal and Satilla Soil Conservation Districts of Georgia, which cover 13 counties in the southeastern part of the State. This area is noted mainly for its production of pine trees for pulpwood and timber.

About 1 million acres in these districts are producing slow growing hardwoods of little commercial value. Most of this million acres is waterlogged, and known to the local people as hardwood swamps. Under present swampy conditions it takes from 60 to 90 years for the native hardwood trees to grow large enough for harvest as pulpwood. Then the pulpwood is of inferior quality to that of fast growing pine trees.

Recently, some of the pulpwood companies and individual landowners have found that removal of excess surface water may turn these "hardwood swamps" into profitable woodlands. The better species of pine trees will grow large enough for pulpwood in 15 to 20 years. This means that landowners can produce 3 or 4 crops of pine trees in the same time it takes to produce one harvestable crop of hardwood. Furthermore, the pine trees sell for about 25 percent more as pulpwood than do the hardwood trees.

Landowners in the two soil conservation districts have constructed more than 200 miles of water control ditches during the past few years. These ditches have benefitted about 50,000 acres.

For example, in 1947 Mr. Alfred W. Jones constructed 3 miles of drainage ditch to remove excess surface water from 1,700 acres of woodland. This project was designed and checked by SCS technicians assigned to work with the Satilla River Soil Conservation District in Glynn County. The ditch was dug with a dragline at a cost of about $6.87 per acre of land benefitted. The ditch, about 4 feet deep,

Drainage ditch on the Alfred W. Jones farm: (above) the ditch soon after construction, (below) the same ditch 8 years later.

Note:—The author is area conservationist, Soil Conservation Service, Waycross, Ga.

Part of the hardwood swamp on the Jones farm: (left) before drainage of excess surface water, (right) the same location 8 years after drainage.

was designed to remove excess surface water only and not to lower soil profile water. The results were highly satisfactory. Mr. Jones now has a fast growing pine forest, established mainly by natural reseeding from adjacent pine trees, on most of this land. He must wait a few more years before he harvests his first profitable crop of pine pulpwood, but he figures that his profits on this investment will be many-fold and continue for a long time.

The results obtained on the Jones' farm and other woodland tracts of the area show that the removal of excess surface water from these hardwood swamps is a practical means of converting these swamps to new slash pine sites, either by natural reseeding or by planting.

Thoreau With A Camera

A Naturalist Writes About, Photographs, and Practices Conservation of Wildlife, Soil, Water, and Forests.

By LESTER FOX

LEONARD LEE RUE III might well be called a Henry David Thoreau with a camera. The two have several things in common. Like Thoreau, Rue is a natural naturalist. He is a close observer and analyst of things around him. He lives much as Thoreau did. He doesn't live in the woods in a hut on Walden Pond. But he does live in the woods, in a cabin on the Delaware River not far from Belvidere, N. J. Like Thoreau, Rue lectures and writes about his observations. Similarly, Rue does not limit his interest to wildlife alone. His interests embrace conservation in its broadest sense.

Note:—The author is an information specialist, Soil Conservation Service, Upper Darby, Pa.

If cameras had been available in Thoreau's day, he undoubtedly would have photographed what he saw. That is what Rue does. He has pictured Nature from Florida to Canada. He has had Nature brought to him at his sylvan retreat from other parts of the country. He plans to extend his travels to widen his range of picturetaking.

Rue's photographs—both color and black and white are used all over the world. He supplies photographs to 70 companies and 400 publications. His preference is for conservation subjects. An example of his work: With a strobe light built especially for him, he took a picture of a flying squirrel from beneath at 1/40,000th

Leonard Lee Rue, III checking some of his camera equipment.

of a second. The squirrel was in graceful flight. An educational magazine published the picture. A popular monthly saw the published photo and phoned Rue for a copy—at a handsome price. A German camera manufacturer bought a print to use in its sales promotion literature. A New York City newspaper ordered a copy. The photo is to be used also in an American Museum of Natural History encyclopedia, two college textbooks, half a dozen State conservation magazines. It has been published in England, France, and Switzerland. Orders are still coming in.

Rue has a roomful of cameras and accessories. He uses different types of cameras that take pictures of various sizes and for different purposes. His accessories include telephoto lenses as long as your arm and automatic shutter trippers. Yet, with all this equipment, one picture had eluded him. He wanted to photograph a rattlesnake at the instant it struck its victim, in this case a ball. But he had no device that could trip the camera shutter fast enough. His shutter was too slow and always pictured the snake on the recoil. So a manufacturer agreed to make Rue a special electric eye that would work fast enough in operating the shutter to get the picture he wanted.

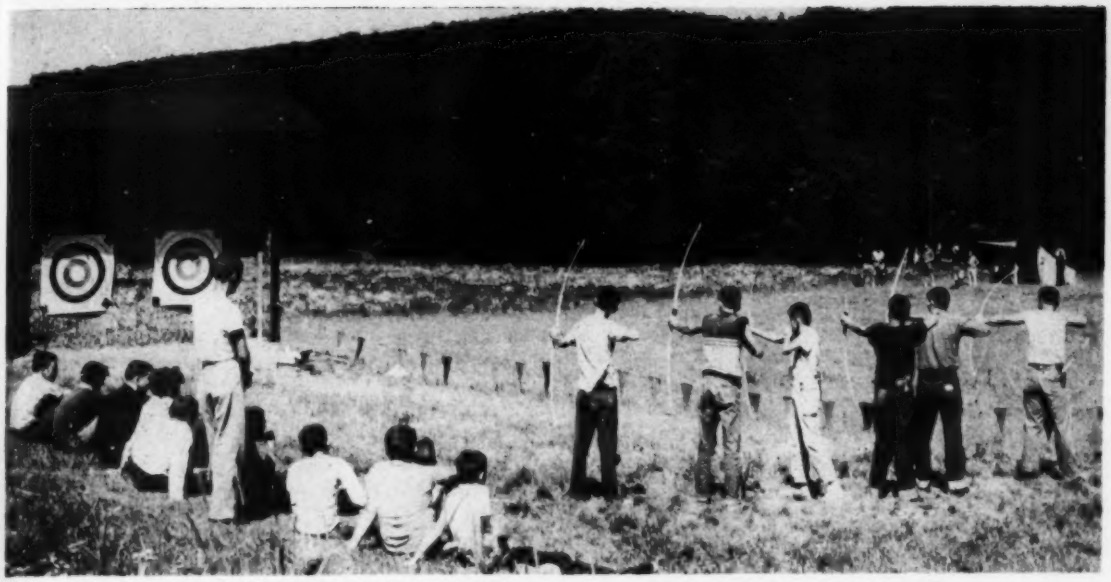
Lennie Rue started taking pictures when as a boy he was given a box camera. "This might seem funny, when you look at all the high-powered equipment I have now, but I'm still selling a picture I took with that box camera," Rue said. "It's a picture of a bear I took in Tennessee."

Rue came by his interest in conservation naturally. He went to elementary school in Paterson, N. J., where he was born. When he was 11, his family moved to a farm at Manunkachunk, N. J. He spent the rest of his boyhood on the farm. He studied Vocational Agriculture in school. He did not finish high school. By then he had developed a definite leaning toward conservation. He spent much of his time in the woods studying nature.

"When I was 8 years old, I was given my first book on birds," Rue recalls. "That sharpened my interest in nature. I have been making a study of wildlife, natural history, and all the other phases of conservation ever since. When I was 25, I decided that nature photography was my life's work."

When he was 19 (he's 32 now) Rue got started in writing by contributing a column on nature to the *Washington Weekly Star*, published near his home. "The pay wasn't much but the discipline was good for me," Rue says.

A part of the 82-acre farm near the Delaware River that is to be developed as a wildlife refuge by the Washington Council of the Boy Scouts.



Boy Scouts practicing archery at Camp Pahaquarra. (Photo by Leonard Lee Rue, III)

"I had to keep writing to meet the weekly deadlines."

Rue now writes, as well as photographs, for a number of nationally known magazines devoted to various phases of conservation. His first book was *Nature In Motion,* published through the Audubon Society as one in a series of a junior book club. Besides doing the text, Rue contributed 10 color and 19 black and white photographs. His latest interest: A new book titled *Land Animals of North America.*

"Seventy percent of the book will be pictures," he said when he was working on it. "That's because people don't want to be educated—they want to be informed. There's a difference, you know." Rue is an educator though. He teaches woodcraft and nature at a private school in Blairstown, N. J.

Throughout the summer Rue guides groups of Boy Scouts on canoe trips through the woods of Canada. His basic aim is to make the boys aware of conservation and develop their interest in it.

He is a camp ranger of the George Washington Council of the Boy Scouts. He lives with his wife Elizabeth and their three sons at the council's 1,200-acre Camp Pahaquarra on the Delaware River.

Adjoining Camp Pahaquarra is an 82-acre river bottom farm. It is the historic site of the old Dimmick ferry that had linked New Jersey with Pennsylvania. The land was worn out and rundown from continuous corn cropping. For years Donald K. Wolff, head of the Belvidere Soil Conservation Service office, had been eyeing the farm. He was hopeful that someone would buy it who would put it under a conservation program. That hope was shared by Rue. They both thought that the Boy Scouts were the ones who should buy it. Both had visions of making it into a model farm featuring wildlife and woodland conservation.

Two years ago the Boy Scout Council bought the place. Rue's and Wolff's dream began to take form. The council signed an agreement with the Warren County Soil Conservation District to help apply a coordinated soil conservation program to the land. Rue and Wolff worked together in developing the plan. Their uppermost thought was to use the farm in teaching conservation to the Boy Scouts and in showing others how to work with Nature.

Workers started applying the conservation plan last spring. The plan calls for the installation of 62-foot contour strips of soybeans, New Jersey wildlife food-patch mixture, red and sweet clover, rye, bicolor lespedeza, alfalfa, Kentucky 31 fescue, sericea lespedeza, and

birdsfoot trefoil. Between the strips are rows of wildlife shrubs, including multiflora rose, tartarian honeysuckle, and autumn olive.

The conservation plan also calls for planting Norway spruce, Austrian pine, sawtooth oak from Korea, and Chinese chestnut trees. Another important part of the plan is the building of a 6½-acre pond. The lower part of the pond is to be stocked with fish. The upper half will form part of a marsh development.

"This," Rue said, "is to be our conservation show place."

A prize shot of wildlife in the wild made by Leonard Lee Rue, III.